

## Determining molar absorption coefficients for rhyolitic glass

Alexander R Nichols<sup>1</sup>, Robert B Stewart<sup>2</sup>, Ian Schipper<sup>3</sup>

<sup>1</sup>IFREE, JAMSTEC, Japan, <sup>2</sup>Massey University, New Zealand, <sup>3</sup>Victoria University of Wellington, New Zealand

E-mail: r.b.stewart@massey.ac.nz

The objective of this research project is to determine robust molar absorption coefficients to be used in the measurement of H<sub>2</sub>O and CO<sub>2</sub> in silica-rich glasses by Fourier Transform Infrared spectroscopy (FTIR). Compositionally dependent molar absorption coefficients are required to calculate H<sub>2</sub>O and CO<sub>2</sub> contents from FTIR spectra. However, while the coefficients are reasonably well established for basaltic glasses, paradoxically for silica-rich glasses they are poorly constrained, despite such compositions being typically associated with more explosive eruptions driven by volatiles (primarily H<sub>2</sub>O and CO<sub>2</sub>). A sample of Ben Lomond rhyolite from the Maroa Centre in the Taupo Volcanic Zone of New Zealand was crushed and glass particles with minimal microvesicle contents were hand-picked for density determination. Random sample densities ranged from 2288-2350 kg/m<sup>3</sup> while the hand-picked sample density was 2397kg/m<sup>3</sup>, reflecting the significant impact of microvesicularity. Microdrilled rhyolite cores were hydrated in an internally heated autoclave at the Institut des Sciences de la Terre d'Orleans, CNRS - Universite d'Orleans to a range of nominal water contents from 0.5 to 5 wt%. The samples were analysed by micro-FTIR at Massey University using a Nicolet Continuum microscope and 6700 bench. Spectra were collected using a globar source, KBr beam splitter and MCT detector. Absorbances of water peaks in the near-IR region, caused by the combination of stretching and bending of H<sub>2</sub>O mol at 5200 cm<sup>-1</sup> and Si-OH and Al-OH vibrations at 4500 cm<sup>-1</sup>, were measured in thick wafers. The wafers were then thinned to allow absorbances in the mid-IR region, caused by the fundamental OH-stretching vibration at 3500 cm<sup>-1</sup> (for total H<sub>2</sub>O) and bending of H<sub>2</sub>O mol at 1600 cm<sup>-1</sup>, to be measured. Splits of the same samples were also analysed at the Institute for Research on Earth Evolution (IFREE), Japan Agency for Marine Earth Science and Technology (JAMSTEC) using a Varian FTS Stingray 7000 Micro Image Analyzer spectrometer. Absorbances of peaks in the near-IR region were measured in spectra from thick wafers using the same set up as before, and the same spots were then analysed again using the optimal set up for measurements in the near-IR region, a halogen source, CaF<sub>2</sub> beam splitter and MCT detector, in order to compare results. Finally, in order to check for homogeneity in the experimental charges, FTIR imaging was performed on both thick and thin wafers using a focal-plane array (FPA) detector and both KBr and CaF<sub>2</sub> beam splitters with a globar source. Independent measurements of water content are currently being made by Differential Thermal Analysis/Differential Scanning Calorimetry (DTA/DSC) at Massey University in order to independently determine total H<sub>2</sub>O contents, and thus allow molar absorption coefficients to be constrained for each of the peaks.